FETATRACK SERIES 21T CARDIOTOCOGRAPH SERVICE MANUAL

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SERVICE INFORMATION

GENERAL introduction

Introduction

The FETATRACK SERIES 21T CARDIOTOCOGRAPH monitor is a sensitive instrument for the measurement and recording of up to two foetal heartbeats at any one time.

It is designed and manufactured to strict quality control standards and any unauthorised modifications, including the fitment of components other than those supplied and certified by the manufacturer, invalidates the manufacturer's warranty.

This service manual has been written in order to assist in the maintenance and repair of the FETATRACK SERIES 21T CARDIOTOCOGRAPH.

The monitor should only be serviced by qualified technicians, and then only after careful study of this manual.

Safety checks applicable to the monitor are contained in this manual at page 28. All instruments are thoroughly checked in accordance with these instructions prior to shipment to customers, but periodic scheduled safety checks are strongly recommended in order to ensure that the monitor continues to meet safety specifications.

All drawings and circuit descriptions contained within this manual are correct as of the date this instrument was assembled and tested, but the manufacturer reserves the right to make such changes as deemed necessary to improve the design and operational standard. If this instrument does not exactly conform to details as given in this manual, the manufacturer should be contacted in order to obtain revision information.

Unpacking

Note: Retain all the packing material for possible future use.

Upon receipt, this instrument should be inspected for any form of physical damage and checked for correct functional operation.

For any physical damage noted or operational malfunction experienced, Seward Ltd. should be notified immediately at the manufacturers address stated on page 2.

The instrument may be operated at a nominal voltage of either 110 volts AC or 240 volts AC 50/60 Hz, according to local supply ratings. A fitted universal power supply allows input voltages of 90 260 volts AC with no configuration setting necessary for the instrument.

In the event that the equipment needs to be returned to Seward Ltd., for servicing, or any other reason, then use the same packing material in which the instrument was delivered. If this is not possible, the instrument should be packaged in a strong box of suitable size and with adequate protective padding.

Manufacturers address:

Seward Ltd.
Roman Way
Fison Way Industrial Estate
Thetford
Norfolk
IP24 1XB
Telephone: 01842 754706
FAX: 01842 755039

Safety

This instrument has been designed to meet IEC601 part 1 (BS5724 part 1) requirements. The following procedures are recommended to ensure continued maximum safety for the patient and operator:

- Do not service the instrument or its accessories, while it is being used on a patient.
- Always inspect transducers, cables and power lead before using the monitor. If the power lead or associated electric plug become damaged in any way whatsoever, then they should be replaced immediately by a qualified technician. Do not use the instrument until such repairs have been carried out.
- The power lead of this instrument should only be plugged into a three wire grounded receptacle. The required power source for operation is single-phase with the neutral line at, or near, ground potential, and with a separate safety-grounded conductor. The receptacle should be wired in accordance with the National Electrical Code.
- Dangerous voltages exist within this instrument. Covers and panels MUST be in place and secured while it is in use, and MUST ONLY be removed by a qualified technician.
- The units are NOT explosion proof and MUST NOT be used in the presence of flammable anaesthetics.
- The rear panel accessory connector is provided to interface with specially designed accessories. Total leakage current, including approved accessories, shall not exceed the requirements of BS5724 part 1 (IEC601 part 1).
- If in any doubt regarding the correct operation of this instrument or interpretation of resultant information, foetal condition MUST be checked immediately by an alternative method.

Abbreviations

Abbreviations used within this manual are:

A (a)	Amperes (Amps).
AC (a.c.)	Alternating Current.
ACIA	Asynchronous Communications Interface Adaptor.
A/D	Analogue/Digital.
AGC	Automatic Gain Control.
b	Beats.
BPM	Bauds per Minute.
cm	Centimetre(s).
Conn	Connector.
CPU	Central Processor Unit.
DC (d.c.)	Direct Current.
DVM	Digital Voltmeter.
ECG	Electrocardiograph.
ECN	Engineering Change Note.
EPROM	Erasable Programmable Read Only Memory.
FECG/INT UA	Fetal Electrocardiograph/Internal Uterine Activity.
FET	Field Effect Transistor.
FHR	Fetal Heart Rate.
GAL	Gate Array Logic.
gm	Gramme.

GND	Ground.
Hex	Hexadecimal.
Hz	Hertz.
IC	Integrated Circuit.
IUP	IntraUterine Pressure.
IUT	Instrument Under Test.
LCD	Liquid Crystal Display.
LED	Light Emitting Diode.
mA	Milliamps.
MHz	Megahertz.
mV	Millivolts.
PCB	Printed Circuit Board.
Pk Pk	Peak to Peak.
RAM	Random Access Memory.
RMS (r.m.s.)	Root Mean Square.
SBC	Single Board Computer.
Skt	Socket.
SS	Stainless Steal.
TTL	Transistor-Transistor-Logic.
UA	Uterine Activity.
US/EXT UA	Ultrasound/External Uterine Activity.
V (v)	Voltage (volts).
XTL	Crystal.

Description of the Instrument

Front Panel

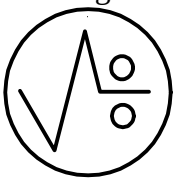
The front panel of the instrument contains various facilities to control the general monitoring functions.

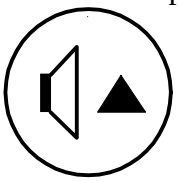
Panel mounted membrane activated switches are operated by pressing for approximately one second.

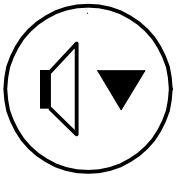
Mains ON/OFF indicator.

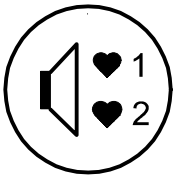
Liquid Crystal Display (LCD) module and its respective display PCB.

Printer ON/OFF controls the operation of the thermal printer. Pressing once, switches the printer ON at the preset speed and pressing again changes the printer speed. Pressing and holding, switches the printer OFF and fast feeds blank paper.

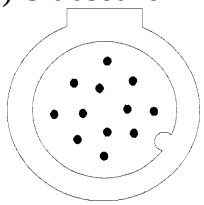


Volume Control Switches (Quantity 2). One switch, with arrow marker pointing upwards, in order to increase output level from speaker. 

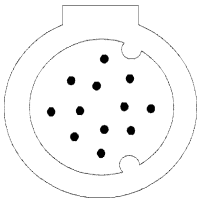
One switch, with arrow marker pointing downwards, in order to decrease output level from speaker. 

Volume Control Selector Switch for audible monitoring of either foetal 1 or foetal 2 audio signals. 

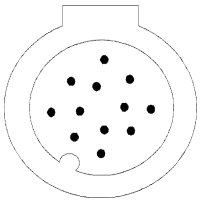
Uterine Activity Zero (UA) for setting the zero reference value for the Toco transducers.

Cardio 1, 12-pin polarised input socket for Foetal Heart Rate (FHR) Ultrasound transducer or Electrocardiograph (ECG) input. Coloured pink. 

Uterine Activity, 12-pin polarised input socket for Toco or IntraUterine pressure transducer input. Coloured yellow.



Cardio 2, 12-pin polarised input socket for foetal heart rate (FHR) Ultrasound transducer or Electrocardiograph (ECG) input. Coloured blue.



US/EXT UA (Ultrasound/External Uterine Activity).
FECG/INT UA (Foetal Electrocardiograph/Internal Uterine Activity).

Rear Panel

Facilities and controls supported by the rear panel are:

- AC Line Input receptacle (3pin IEC standard) for connection to the mains supply via a suitable power lead.
- Fuses F1 and F2 incorporated in the a.c. line input receptacle. The fuses are externally accessible, just above the a.c. line input receptacle.

For 110 VAC operation, the rating of the fuses are 2 amps (slow blow), 250 volts rating.

For 240 VAC operation, the rating of the fuses are 2 amps (slow blow), 250 volts rating.

- ON/OFF toggle switch which allows mains a.c. power to be applied to the Line/Neutral/Earth (L/N/E) terminals of the internal power supply unit. Mains power may be either 110 or 240 VAC at 50/60 Hz, dependant upon mains availability at the location.

External Mark jack socket, for equipment connection to a patient operated push-switch, used for signalling fetal movement.

- Accessory socket (15way 'D' type) for equipment connection to external peripherals.

Internal Layout

The following descriptions assume that the top cover has been removed and the front panel facing the viewer.

- Thermal Printer Assembly left front, with paper read-out through front panel. The printer records Foetal Heart Rate (FHR), Uterine Activity (UA) and Foetal

Movement (Event Mark), together with date, time and recorder speed on thermosensitive z-fold paper.

- Digital printed circuit board (p.c.b.) an 'L' shaped p.c.b. with the major area lying along the equipment's right-hand side. At the instrument rear, this p.c.b. lies under the DEXDYNE p.c.b.. On the right hand side of the Digital p.c.b. is a 64way indirect edge connector, into which is vertically mounted, a plug-in ECG/IUP card.
- DEXDYNE printed circuit board (p.c.b.) a rectangular p.c.b. that lies flat, from left to right, along the rear of the instrument. The left hand side of the p.c.b. lies beneath the power supply unit, and the right hand side of the board lies above the digital p.c.b..
- Power supply (XP) fitted on the left hand side of the instrument, behind the printer assembly and above the DEXDYNE p.c.b..

Dismantling Instructions

Warning: before dismantling the instrument, ensure that the mains power is removed and <u>all</u> leads (inclusive transducers) are disconnected and suitably stored.

This section describes the sequences required to dismantle the instrument and gain access to the various units.

The top cover has to be removed first, in order to allow access to all the instrument sub-assemblies. This is carried out by inverting the unit and resting it, cover down, on a clean and protective surface. There are four M4 securing screws to be removed from around the periphery of the base one screw sited close to each instrument foot. The instrument should then be carefully re-inverted and placed on its feet when the cover may now be removed by lifting it upwards, away from the base. Ensure that the earth bonding cable, connecting the cover to the base earth, is disconnected by removing the securing nut and washers.

The main units of the instrument are :

Item	Description
1	Front Panel
2	ECG PCB
3	Display PCB
4	LCD Module
5	Printer
6	Rear Panel
7	Power Supply
8	DEXDYNE PCB
9	Digital PCB

Front Panel Associated Items

Items 25 are associated with the Front Panel for dismantling requirements, the removal of which will allow direct removal of any of these stated items without physical effect on any of the others.

Although the Digital p.c.b. is mainly associated with the Rear Panel, certain considerations of the Front Panel will be necessary when requiring to dismantle/fully access this p.c.b.. This will be dealt with under Rear Panel Associated Items.

Separation of the Front Panel from the base is affected by <u>removal</u> of:

- Connector at J23 on Digital p.c.b. (linked to UA socket).
- Connector at J24 on Digital p.c.b. (linked to Cardio 1, UA and Cardio 2 sockets).
- Connector at J4 on Digital p.c.b. (linked to Display p.c.b.).
- Connector at JM20 on Digital p.c.b. (linked to Cardio 1 socket).
- Connector at JM21 on Digital p.c.b. (linked to Cardio 2 socket).
- Connector at J14 on Digital p.c.b. (linked to Display p.c.b.).
- Connector on ECG p.c.b. (linked to Cardio 2 socket).

Removal of Rear Panel may now be carried out by unscrewing the three M3 Base holding screws.

Note: The following dismantling procedures assume that the front panel has been removed as detailed above. Dismantling will now only involve the associated fixings except for the earth connection to the Printer.

<u>Item 2 Electrocardiograph (ECG) PCB.</u>

- Remove the two 'O' rings one on each p.c.b. guide.
- Carefully ease the p.c.b vertically away from the associated edge connector on the Digital p.c.b..

Items 3 and 4 Display PCB and LCD Display.

These are permanently solder linked by a Nortronic 14way flexistrip and will be dismantled together by removal of:

- Two screws securing the Display p.c.b..
- Two screws securing the LCD module.

Six metal twist type securing pieces associated with the LCD module will require careful adjustment in order to allow full release of this unit.

Item 5 Printer.

- Removal of chassis earth wire at point 'H' (Ref. Drawing M/1/0002) by unscrewing the associated M4 securing nut.
- Removal of two screws securing Printer to base.

Note: Belt replacement is affected by pulley removal each pulley is secured to its respective spindle by a single hexagon socket set screw through the pulley gears.

Rear Panel Associated Items

Items 79 are associated with the Rear Panel, which requires to be removed before these items may be dismantled or fully accessed. Dependant upon the unit required to be removed or fully accessed, will determine the degree of sequential dismantling required.

As stated under Front Panel Associated Items, the Front Panel has to be considered for dismantling/full access of the Digital p.c.b..

Sequential dismantling down to the Digital p.c.b. is:

First Rear Panel.
Second Power Supply.
Third DEXDYNE PCB.
Fourth Digital PCB.

Separation of the Rear Panel from the base is affected by removal of:

- Connector at J22 on Digital p.c.b. (linked to speaker).
- Line (brown) and neutral (blue) wires from Fused Appliance Filter Inlet.
- Line (brown) and neutral (blue) wires from ON/OFF switch.
- Earth wire from rear panel by removal of M4 hexagon nut.
- Nut from External Mark jack socket.

Removal of Front Panel may now be carried out by unscrewing the two M3 Base holding screws.

Note: The following dismantling procedures assume that the Rear Panel has been removed as detailed above.

Item 7 Power Supply.

- Disconnect 13way connector from p.c.b. at rear of Power Supply unit.
- Disconnect 5way connector from p.c.b. at rear of Power Supply unit.

Removal of Power Supply unit may now be carried out by unscrewing the four M4 Base holding screws.

Item 8 DEXDYNE PCB.

- Remove 0/+5v plug at JP5 on DEXDYNE p.c.b..
- Remove 60way connector at JP13 on the DEXDYNE p.c.b..

The DEXDYNE p.c.b. may now be removed by unscrewing four M4 screws:

- Two screws from pillars secured to Digital p.c.b..
- Two screws from pillars secured to base.

Item 9 Digital PCB.

This will entail the removal of the Front Panel:

- Remove connector at J23 on Digital p.c.b. (linked to UA socket).
- Remove connector at J24 on Digital p.c.b. (linked to Cardio 1, UA and Cardio 2 sockets).
- Remove connector at J4 on Digital p.c.b. (linked to Display p.c.b.).
- Remove connector at JM20 on Digital p.c.b. (linked to Cardio 1 socket).
- Remove connector at JM21 on Digital p.c.b. (linked to Cardio 2 socket).
- Remove connector at J14 on Digital p.c.b. (linked to Display p.c.b.).
- Remove connector on ECG p.c.b. (linked to Cardio 2 socket).
- Remove Front Panel by unscrewing the three M3 Base holding screws.

Once the Front Panel has been removed, the dismantling/full access of the Digital p.c.b. proceeds:

- Remove the two 'O' rings associated with the ECG one on each p.c.b. guide.
- Remove guide/p.c.b securing screw on each ECG guide.
- Carefully ease the ECG p.c.b. vertically away from the associated edge connector on the Digital p.c.b..
- Remove the M4 securing screws to release the Digital p.c.b. from the Base.

Circuit descriptions

Introduction

Circuit diagrams quoted within this section are enclosed at the rear of this manual. The electronic hardware design for the FETATRACK SERIES 21T CARDIOTOCOGRAPH is based upon a Single Board Computer (SBC), supplied by Dexdyne Ltd. The primary interface to the rest of the circuitry uses a standard PC104 interface as defined in the Intel ISA bus standard. The bus connects to a main digital p.c.b.(FMX \ 002 01 6) via a 60-way ribbon connector. The main printed circuit board (p.c.b.) itself has a 32-way female DIN connector, where a further ECG p.c.b. may be plugged in to provide both ECG and IUP functionality.

The main p.c.b. also has several other interfaces, including:

- Thermal printer drive (Harwin J5, J6).
- Two channels of ultrasound (Harwin JM20, JM21).
- Digital input / output for defining front panel connector status (Harwin J24).
- LCD and front panel switch interface (20-way ribbon cable).
- Audio output (Harwin J22).
- TOCO interface (3-way Harwin crimp terminal).
- Auxiliary 'D' type connector, including RS232 interface and external tape input.
- Event mark (jack plug, input).
- Event mark (Harwin J14, output).
- Main power supply connector (8-way Molex).

Power Supply

The main power supply of the 21T is a medically approved (UL544 anIEC 601 / VDE 0750) switching unit, manufactured by XP. The unit, designated NFS 110 7902P, has a universal input voltage range of 85 264 volts r.m.s., and input frequency range of 47 440 Hz. The unit is rated at 110 watts, supplying quad outputs with the following characteristics:

+ 5 volts @ 5 amps.
+ 12 volts @ 2 amps.
12 volts @ 2 amps.
+ 24 volts @ 2.5 amps.

The power supply is a line replaceable unit, and if suspected of failure, should be completely replaced. The casing of the unit should not be removed. The input and output pins are as given in Tables 1 and 2, with stated pin allocations as observed from the top of the unit.

Table 1: 3-way Molex (Mains Input)

Pin Numbers	Description
Pin 1	Earth
Pin 2	Neutral
Pin 3	Live

Table 2: 13-way Molex (DC Output)

Pin Numbers	Description
Pins 1, 2 and 3	+ 5 volts
Pins 4, 5, 6, and 7	0 volts
Pins 8 and 9	+12 volts

Pin 11 12 volts
Pin 13 + 24 volts

Ultrasound Circuit

The circuitry associated with the two ultrasound channels is incorporated on the main Digital p.c.b. and both are effectively identical. Therefore, the following description will only apply to channel 1, although it is directly applicable to channel 2.
There are three separate circuits per channel:

- **Oscillator and Transmitter Amplifier Circuit**
  Circuit diagram 002 06 6 refers.
  Transistor QX1 and associated components LM1, CX2, CX3 and RX1 form a Colpitts oscillator, running at a nominal frequency of 2 MHz.
  Components RX2, RX3, QX2 and VM1 form an emitter follower to buffer the oscillator to the next stage, and to provide oscillator amplititude control. CX4 a.c. couples the oscillator to the buffer.
  The final stage of this circuit forms a tuned circuit that may be adjusted to match the output impedance of the ultrasound transmitting crystal.
  CX6 and TM1 form the tuned circuit in association with QX3, RM3, RX4 and RX5.
  The output from TM1 goes, via signal filters (not fitted in this application), to JM20 on the main Digital p.c.b.
- **Receiver and Detector Circuit**
  Circuit diagram 002 06 6 refers
  TM2 and CX9 form the tuned input circuit for the received modulated ultrasonic signal.
  Transistors QX4 and QX5 form a cascode amplifier, enabling an optimal received signal.
  DC bias for the amplifier is set by RX7 and RX8 at the gate of QX4. The tuned circuit load in the drain of QX4, namely LM2 and CX8, is adjusted to peak the received signal.
  Diode DM1 acts as a peak detector to remove the audio Doppler shift signal from the 2MHz carrier. The time constant of components RX10 and CX10 remove the higher frequency signal, enabling the audio signal to be applied to a band-pass filter via a.c. coupling capacitor CX11. The band-pass filter has a pass band of 150 Hz 1 kHz to further optimise the audio output signal.
  Operational amplifier UM1 provides some gain and provides a low output impedance drive to the next stage.
  The d.c. supply arrangement, showing filter U28 and regulator U32, convert the +15 volt supply rail into a clean +8 volt supply rail for the ultrasound d.c. supply. Circuit diagram 002 05 6 refers.
- **Audio Amplifier**
  Circuit diagram 002 07 6 refers.
  An analogue switch (U17) at the front end of the audio amplifier allows one of the four following analogue channels to be selected:
    1. Ultrasound audio channel 1.
    2. Ultrasound audio channel 2.
    3. ECG bleep an approximate tone of 2 kHz for indicating ECG correlation.
    4. External tape input used off-line as required via a tape deck, using pre-recorded

foetal ultrasound heart beats.

The selected signal is controlled via U15B, which in turn is controlled via the PC104 bus interface from the 486 SBC under programme control.

The two ultrasound inputs are fed to the switch via two identical circuits associated with the two operational amplifiers UB1 and UB2. These are configured as noninverting gain amplifiers, used to boost the signal level to the audio amplifier. They are AC coupled to allow for a change in d.c. operating conditions.

The output from the analogue switch is fed via two buffer amplifiers U11B and U11A. In conjunction with digital potentiometer U10, these buffers perform a volume control function for the amplifier. The digital potentiometer U10 is controlled via the PC104 bus under programme control.

The loudspeaker is driven by a dual 8 watt push-pull audio amplifier, which has two separate amplifier stages shown as U4A and U4B. The amplifiers provide the power to drive an 8 ohm speaker. The operational amplifier U3 provides signal inversion and conditioning from the received signal.

The filter U2 ensures a clean +24 volt supply rail for the audio amplifier.

Tocodynamometer Circuit (Toco)

Circuit diagram 002 05 6 refers.

The Toco circuit is incorporated on the main Digital p.c.b. The Toco transducer connects via the front panel wiring of the UA transducer to J23 3-way header:

- Pin1 is the 5.1 VDC drive to the transducer.
- Pin 2 is the 5.1 VDC drive to the transducer.
- Pin 3 is the return signal from the transducer.

The supply voltages on pin 1 and pin2 are derived from a 5.1V zener diode, before being buffered and applied via U36A (pin 1) and inverted via U36B (pin2). The input signal is amplified at d.c. with a low pass filter action to remove unwanted high frequency noise. The cut-off point of the filter is 0.8 Hz.

The excited bridge circuit within the Toco transducer returns a DC voltage on pin 3 that is proportional to the pressure places across the membrane of the transducer.

Printer Interface Circuit

Circuit diagram 002 03 6 refers.

The printer interface circuit is incorporated on the main Digital p.c.b.. The circuit can be considered as two areas:

- The first area consists of the thermal print head, which is driven from the outputs of header J5 (15-way Harwin). The thermal print head is a serially loaded device, that derives its timing signals from a combination of programmable Gate Array Logic (GAL) components U12 and U13. These have been programmed to perform a set functionality for a given set of input conditions.

  The start of each cycle is initiated via the PC104 bus interface.

  The data for the print head is derived from parallel loaded shift register U19 (loaded from the PC104 interface), the output of which is synchronised by the timing of the two GAL's.
- The second area consists of the motor drive for a 2-phase bipolar stepper motor, having a step angle of 1.8 degrees. The motor is driven using a four channel push-pull driver circuit (U18) with inductive load protection at its output consisting of diodes D2D5 and D9D12. The output drive appears at

header J6 (10-way Harwin) for connection to the motor. The motor step function is carried out under software control in conjunction with programmable device U12.

Main Digital PCB

Circuit diagrams 002 02 6, 002 02 6 and 002 02 6 refer.

Areas of the main Digital p.c.b. not described above, are included in this section.

PC104 interface control signals that connect to the Dexdyne p.c.b. are via a 60-way ribbon cable and associated connector. U16 is the decoding GAL programmable logic device, used to derive all read/write control lines to the various sections of the Digital p.c.b..

Transistor Q1 is used to drive the reset signal from the PC104 interface to the distributed reset required on the main Digital p.c.b..

U20 is a latch for controlling the 21T volume control, ECG AGC circuitry and audio selection logic. Latch U20 is I/O mapped.

U37 and connector J24 allow connection to logic inputs, enabling the determination of front panel connector status and other auxiliary inputs. Latch U37 is I/O mapped.

Circuitry on the main Digital p.c.b. allows AD conversion to be performed. U24 is the AD converter, which is an 8-channel input device controlled via the PC104 bus using U23 (write latch), U21 (read latch) and U22 signal control programmable logic device.

U6, in conjunction with U14, generate all clock signal timing references for the main Digital p.c.b.. The master oscillator input is from U5, a TTL oscillator operating at 8 MHz.

Dexdyne PCB

The Dexdyne p.c.b. is a stand alone Single Board Computer (SBC). It is PCAT compatible and specifically designed for the embedded OEM market place.

This application requires the microprocessor to have a co-processor resident for intensive mathematical functions, thus enabling it to provide the necessary computing power for the 21T processing requirements.

The currently used version of the 486 uses a DX4 100 486 chip. Other versions used include an IBM DX2 processor. Features of the p.c.b. include:

- Support chip set, incorporating power management, local-bus IDE disk interface, standard AT keyboard interface and a standard AT battery backed Real Time Clock.
- Interface to the main Digital p.c.b. is via the PC104 interface, which physically uses a 60-way cable. The allocated memory address space for the Digital p.c.b. is I/O mapped to a base address of 340 Hexadecimal, in the 486 address space. All reading and writing to the main Digital p.c.b. from the Dexdyne p.c.b. is derived from this base address.

Note: Due to the nature and complexity of the p.c.b., it is not intended to describe its operation. It is a line replaceable item that should be changed if suspected as faulty.

Display and Keyboard Circuit Interface

The Display/Keyboard interface p.c.b. data is transferred from the main Digital p.c.b. via a 20-way ribbon cable and associated connector, plugged into J4. An LCD display module (proprietary item) is connected to the Display/Keyboard p.c.b. via a specialised 14-way ribbon type cable. The Display/Keyboard p.c.b. has an interface for six pushbuttons, the conditions of which are read by the Dexdyne p.c.b. as an I/O

mapped peripheral. Also on the p.c.b. are the LED's that define the state of the foetal heart correlation:

- Red none or poor correlation.
- Green indicating a good heart signal being correlated.

Note: The LED's are again part of the I/O map.

The LCD module is driven via a logic interface on the Display/Keyboard interface p.c.b.. The control and data registers of the module are accessed via the I/O mapping of the Dexdyne p.c.b..

ECG and IUP Circuit

Circuit diagrams 02608203 sheets 13 refer.

The ECG p.c.b. has two separate circuits and is located on the right hand side of the Digital p.c.b.. It is vertically connected to the Digital p.c.b. via J3, a 32-way DIN 41612 type connector.

The majority of the circuitry on this p.c.b. is for amplification and isolation of the electrocardiogram signal derived across the heart muscle. The output signal from this p.c.b. is fed via an AD converter on the main Digital p.c.b., where it is sampled such that the control software can derive correlated heart rate.

Reference circuit diagram 02608203 sheet 1, the differential signal from either a foetal or maternal ECG is placed across pins PL1 and PL3, the isolated input to the ECG card. Two buffer amplifiers, U14 and U15, are configured as low gain (approximately 2, to the differential signal) amplifiers, and are primarily in the circuit to minimise the effect of patient electrode offset potentials. The differential signal is then fed to a high gain (1000) instrumentation amplifier U11. Any d.c. offsets are minimised at the output of U11 by feeding back, via U10, a control signal that is inversely proportional to the magnitude of the d.c. output. The signal is then passed from the isolated to non-isolated circuit (02608203 sheet 3 refers) via the linear opto-isolation circuits of U9, U6 and associated components. The signal is then passed through a standard notch filter, which is centred on a frequency of 50 Hz in order to take out any mains hum derived signal.

From here the signal is passed through an AGC stage, where a digital potentiometer (U1) is controlled by the control software on the Dexdyne p.c.b. After further signal conditioning and rectification, the signal is passed via pin 10 on PL2 to the main Digital p.c.b. for sampling.

Other circuits shown on 02608203 sheet 1 shows the power supply unit (PSU) and decoupling components. This PSU is a DC / DC converter, which takes in the d.c. supply to the respective p.c.b. and outputs an isolated + 15v and 15v supply for all the isolated circuits.

The other circuit on 02608203 sheet 1 is for the nonisolated IUP. The IUP input signal, derived from an external pressure transducer, enters PL7 and PL8 into instrumentation amplifier U16 for signal amplification (02608203 sheet 2 refers). The signal is then passed, via a linear isolation circuit comprising U13, OP3, U7 and OP4, to gain stage U7 and filter circuit U8 with associated components. The output d.c. signal is then fed to an AD converter, on the main Digital p.c.b. where it is sampled and used by the control programme for interpretation and display of the IUP signal.

The non-isolated IUP circuit has offset and gain potentiometers, which can be adjusted for optimum output to the AD converter on the main p.c.b..

test and calibration

Introduction

The following tests are necessary in order to ensure that the FETATRACK SERIES 21T CARDIOTOCOGRAPH is operating within specification.

These tests may be carried out in whole or part. However, if any repairs are carried out, then it is recommended that the whole test / calibration procedure is undertaken.

Before proceeding, the hand held event marker should be connected to the rear panel jack socket **EXTERNAL MARKER**.

Paper Out Sensor

Load paper into the recorder paper tray, close the recorder door and switch the recorder ON by depressing the printer control pushbutton on the front panel.

Open the recorder door and remove the chart paper.

Observe the LCD display indicating periodically, that the chart recorder has NO paper-displaying 'Paper Out'.

Replace the chart paper and close the recorder door.

Press the printer control pushbutton to re-start the recorder. The paper will advance at fast speed for a short period and then continue at the selected rate, as chosen in the set-up mode. To change the chart recorder speed, just push the printer control pushbutton momentarily.

Note: Until the printer control pushbutton is pressed, the 'Paper Out' indication will continue.

Ultrasound Simulation, Channel 1

Ensure that the volume control switch has been operated to select Heart Rate 1 audio output. The central front panel pushbutton, when pressed, will initiate a display message on the LCD-either 'HR1 Audio Select' or 'HR2 Audio Select'.

Place a small amount of transmission gel into the palm of your hand and, using the CARDIO 1 (pink) ultrasound transducer, place the hand over the area and gently stroke the back of your hand at a rate of approximately twice per second.

Whilst stroking the back of your hand, check that an output signal is coming from the loudspeaker.

Adjust the volume to maximum by depressing the volume UP pushbutton.

Momentary action will cause a single increment, holding down the pushbutton will cause multiple increments.

Adjust the volume to minimum by depressing the volume DOWN pushbutton.

In both situations, the LCD will display a volume bar graph, as the volume changes.

Reset the volume to maximum.

This signal should be loud and free from any interference or distortion, and should follow the volume UP/DOWN action.

Observe that the FHR Cardio1 display, showing the simulated rate and that the heart shaped foetal pulse LED flashes in time with the audible signal. The foetal pulse LED will change colour with respect to the signal quality of the simulation. The simulated rate should be such that the pulse LED flashes green. Ensure the simulation is continuous.

Reduce the simulated rate and observe that the FHR display follows the simulation, similarly increase the rate and observe that the display follows the increased rate.

Check the tracing on the chart printout this should be continuous and free from any breaks.

Randomly depress the event marker, and observe half arrows are printed just below the 60 BPM line of the Heart Rate chart.
The simulation procedure should be repeated for at least one minute. Check that the data block, printed between the graphs, displays the correct time, date, chart speed and mode of operation
(U/S, EXT, T:OFF, B:OFF).

Ultrasound Simulation, Channel 2

Repeat the Ultrasound Simulation, Channel 1 for the CARDIO 2 ultrasound (blue) channel. Ensure correct audio output is selected.

TOCO Test

Place the Toco transducer face upwards on the work surface. Press the UA zero pushbutton to establish the zero baseline there may be a need to go to *engineering set-up* to change.
Place a 100 gm test weight onto the centre of the transducer, and observe that the Toco trace on the chart printout increases to 20 units (3 units). The LCD will also display the corresponding value.
Remove the weight, the trace should return to its resting value of zero within 20 seconds.
Press and hold down the printer control pushbutton to form feed and stop the printer.
Remove the Toco and Ultrasound transducers from the instrument.
Wipe the Ultrasound transducer clean, ensure that the face is free from all transmission gel before it is placed aside.

ECG Simulation Test (Intrapartum Models Only)

Note: If the IUP Simulation Test (Intrapartum models only) is to be carried out after this test, the IUP transducer should be connected to the instrument before commencement of the ECG simulation test. This is to allow for the settling time required.

Using the Wakeling Instruments ECG simulator model (model number CS20), connect it to the front panel CARDIO 2 socket via the interface lead. Set the rate to 120 BPM, and select the audio output to HR2 audio.
Set up the test Sphygmomanometer to accept the test IUP transducer. Connect the transducer to the unit's UA socket via the interface cable assembly. This is necessary so that the IUP transducer stabilises whilst the ECG tests are being carried out.
Press the printer ON/OFF pushbutton to start the printer select 3 cm/min.
The simulated ECG rate should be establish within 20 seconds, the FHR display will indicate the rate and the ECG bleep tone will be generated by the loudspeaker. The foetal pulse LED will flash in time with the bleep. The rate will be recorded on the chart printout.
The 21T instrument will only allow changes in Heart Rate of up to a maximum of 15 BPM before it will drop the correlation, so changes should go down in steps of fifteen. Thus, the next HR selected should be 105 BPM, 90 BPM, 75 BPM and 60 BPM. Check that at these rates the printout is continuous, and also that no drop-out is observed on the LCD display. Also check that, when increasing the rate in the opposite order, the rate follows again. This test needs checking for four minutes, going UP and DOWN in rates once every minute.

Note:
1. The potentiometer on the ECG simulator specified is very noisy, thus some rate variations may be evident.
2. The minimum rate of 60 BPM is not displayed, therefore it is best to use a rate of 62 BPM at the lower end.

IUP Simulation Test (Intrapartum Models Only)

Press the UA0 pushbutton to set the baseline to zero. Pump the sphygmomanometer until the column of mercury indicates 50 units, and note that the UA display indicates 50 1 unit.

Press the UA ZERO pushbutton, the UA display should go to zero.

Pump the sphygmomanometer until the column of mercury indicates 150 units, and note that the UA display reads 100 2 unit.

Release the valve on the sphygmomanometer and note that the display returns to zero.

Check that the trace on the chart print out follows the changes in pressure. The alignment of the trace should be better than 0.3 mm.

Release the valve in the pump and the trace will return to zero.

Press and hold down the recorder ON / OFF pushbutton. The LCD will indicate 'Form Feed'. The chart recorder will print a summary of patient care details and then fast feed before switching itself OFF.

Remove both the ECG simulator and the sphygmomanometer from the instrument.

Chart Recorder Alignment

Simultaneously press and hold down the UAO pushbutton and Printer ON/OFF pushbuttons. The LCD display will indicate 'Printer Test On' for the top line, and 'UAO To Continue' for the bottom line. The recorder will start to print a test pattern, consisting of two types:

- The first type is an UP/DOWN staircase to show that the vertical line is printing satisfactory.
- The second type consists of diagonal lines that extend to the top and bottom of the chart paper so that alignment of the paper can take place.

To stop the pattern press UA0 the 21T instrument will re-initialise and start again.

Test Trace Inspection

Inspect the trace to ensure that the lateral alignment is within 0.5 mm (i.e. the 50 and 150 lines align with those on the chart paper). The density of the trace is even along the complete length and width of the trace.

Switch the instrument OFF at the rear panel, disconnect from the mains.

Remove test printout, sign and date.

Setting up the Monitor Software Options

The Fetatrack 21T can be configured for specific applications by programming the instrument using the front panel switches.

Connect the instrument to the mains supply and set the mains switch at the rear panel to the ON position. Observe that the green ON LED at the front panel illuminates. If the 486 processor board is running, the LCD display should display two messages:

- 'Seward Fetatrack 21T'.
- 'Version 1.00'.

This is then followed by the display of 'System starting. Please wait', when the UA pushbutton should be pressed in order to enter the setup mode.

The display will now prompt the user to 'Set Defaults', allowing default values to be set by pushing either volume control on the front panel in order to indicate 'YES' to the default values. As they are to be set now, select 'NO' and continue pressing UA for access to the rest of the functions to be set up. Table 3 below, gives a description of the individual fields and their effect. To change the value of the selected field, press VOLUME UP or VOLUME DOWN keys. Pressing UA saves the selected value and moves on to the next field.

Table 3: Monitor Setup Fields /Effects

Field	Value	Description
Set Hours	0 23	Sets the real time clock Hour Mode
Sets Minutes	0 59	Sets the real time clock Minute Mode
Set Day	1 31	Sets the day
Set Month	1 12	Sets the month
Set Year	0 99	Sets the year
Set Hi Alarm	OFF 160 120	Sets Hi Rate alarm OFF Sets Hi Rate alarm ON to indicated BPM Incrementing in 5's: Sets the alarm threshold at which LO alarm computing starts
Set LO Alarm	OFF 60 120	Sets Lo Rate alarm OFF Sets Lo Rate alarm ON to indicated BPM Incrementing in 5s: Sets the alarm threshold at which LO alarm computing starts

Upon completion of the field setup sequence, the instrument can either be returned to 'Operational Mode' or, alternatively, placed into the 'Engineering Setup Mode':

- To return to 'Operational Mode', momentarily press UA.
- To enter 'Engineering Setup Mode', press and hold down UA.

Table 4 gives a description of the individual fields and their effect in 'Engineering Setup Mode'. To change the value of the selected field, press VOLUME UP or VOLUME DOWN keys. Pressing UA saves the selected value and moves on to the next field.

Table 4: Engineering Setup Fields/Effects

Field	Value	Description
Paper Scale	20b 30b	Sets the chart scaling factor to 30 beats/cm Sets the chart scaling factor to 20 beats/cm
Date	DD/MM/YY MM/DD/YY	Sets the printed date to European format of dd/mm/yy Sets the printed date to American format of mm/dd/yy
HR2 Print	Offset Normal	Places Channel 2 ultrasound printout 30 BPM below actual value, enabling minimal dual trace interference Places Channel 2 ultrasound printout at actual position
HR2 Line	Thin Normal	Select thin line print trace Select normal print trace line thickness
Trace ID's	On Off	Turn on trace identifier labels Turn off trace identifier labels
UA Base	Off 1 20	Sets UA relative base reference to zero Sets UA relative base to selected value
UA Filter	Off On	Turns output smoothing of UA output off Turns output smoothing of UA output on
Printer Speed	1 c/m 2 c/m 3 c/m	Change printer chart speed to selected rate
Printer Test	On Off	Select printer test Select no printer test

At this stage, pressing UA will allow all settings entered to be stored before selection of 'Operational Mode'. If any values need to be re-inputted, press UA whilst the message 'Press UA to Enter Setup' is being displayed prior to normal operation commencing.

safety tests

This section details the safety tests which should be performed on the instrument at regular intervals and also after any repair work which could affect the safety aspect of the unit.

Ensure that the safety test equipment is good working order and within its periodic test date.

All test results should be recorded on record sheet TR 0007 and filed for future reference. An example of the TR0007 record sheet contents can be seen at the end of this section.

Test Equipment Requirements

Rigel safety tester Model 233.

Procedure

- The electrical safety tester must be plugged into a standard power socket with a known good earth.
- The instrument to be tested Instrument Under Test (IUT) should be connected to the power outlet on the tester.

Note: For 110 volt instruments, this should be via a suitable variac.

- Set tester to type B (21T Antepartum).
  OR
  Set tester to type BF (21T Antepartum).
- Ensure that the mains switch at the back of the IUT is in the ON position. Depress the front panel switch. Connect the transducers (type B) or the TOCP/Scalp electrode (type BF) to the applied part using crocodile clips.
- Switch ON the safety tester.
- ***TEST 1*** Safety tester system check.

All lamps on the safety tester must be illuminated and the meter needle must indicate within the test arc of the meter scale.

- ***TEST 2*** Supply voltage check.
  Mains LED on and meter reading between 230250 volts.
- ***TEST 3*** Input resistance, mains to case.

Depress test pushbutton, meter reading must be 1 Mohm.

- ***TEST 4*** Insulation resistance, applied part to case (BF only).
  Depress pushbutton, meter reading must be 10 Mohms.
- ***TEST 5*** Protective earth continuity.

Using probe, hold firmly against all metal parts listed below and depress TEST pushbutton for minimum of 2 seconds per operation. Meter reading must be 0.2 ohms in each case:

a. All case screws (front panel, rear panel and cover).
b. Front panel recorder aperture.
c. Recorder door earth.

- ***TEST 6*** Earth leakage current (normal).

Operate the NORMAL/REVERSE switch (the illuminated AP/GND switch must be ` depressed BF only) meter reading must be 500 A.

- ***TEST 7*** Earth leakage current (SFC open supply).

Operate the NORMAL/REVERSE switch (the illuminated AP/GND switch must be depressed BF only) meter reading must be 1000 A.

- ***TEST 8*** Earth leakage current (normal).

Using probe, hold against all metal parts listed below. Operate NORMAL/REVERSE switch. The indicated value must be 100 A in each case:

a. All case screws (front panel, rear panel and cover).
b. Front panel recorder aperture.
c. Recorder door earth.

- ***TEST 9*** Earth leakage current (SFC open ground).

Using the probe, hold against all metal parts listed below. Operate NORMAL/REVERSE switch. The indicated value must be 500 A in each case:

a. All case screws (front panel, rear panel and cover).
b. Front panel recorder aperture.
c. Recorder door earth.

- ***TEST 10*** Earth leakage current (SFC open supply).

Using probe, hold against all metal parts listed below. Operate NORMAL/REVERSE switch. The indicated value must be 500 A in each case:

a. All case screws (front panel, rear panel and cover).
b. Front panel recorder aperture.
c. Recorder door earth.

- ***TEST 11*** Patient leakage current (normal).

Operate NORMAL / REVERSE and each LEAD selector switch, meter reading must be 500 A in each case.

- ***TEST 12*** Patient leakage current (SFC open ground).

Operate NORMAL / REVERSE and each LEAD selector switch, meter reading must be 500 A in each case.

- ***TEST 13*** Patient leakage current (SFC open supply).

Operate NORMAL / REVERSE and each LEAD selector switch, meter reading must be 500 A in each case.

- ***TEST 14*** Patient auxiliary current (normal).
  Operate NORMAL / REVERSE and each LEAD selector switch, meter reading must be 500 A in each case.
- ***TEST 15*** Patient auxiliary current (SFC open ground).
  Operate NORMAL / REVERSE and each LEAD selector switch, meter reading must be 500 A in each case.
- ***TEST 16*** Patient auxiliary current (open supply.
  Operate NORMAL / REVERSE and each LEAD selector switch, meter reading must be 500 A in each case.
- ***TEST 17*** Mains applied part normal phase (type BF only).
  Depress TEST and operate NORMAL / REVERSE switch, meter reading must be 5000 A in each case.
- ***TEST 18*** Mains applied part reverse phase (type BF only).
  Depress TEST and operate NORMAL / REVERSE switch, meter reading must be 5000 A in each case.

TESTS COMPLETE SELECT TEST 1 AND SWITCH OFF BOTH THE SAFETY TESTER AND INSTRUMENT UNDER TEST. THE COMPLETED SAFETY RECORD SHEET SHOULD BE KEPT WITH THE 21T INSTRUMENT.

Example of Test Form TR0007 Contents

Model Unit Serial Number Operator Date

Test	Test Limits	Pass	Fail	Rework	Pass	Fail
1	N/A					
2	200 - 260v					
3	1 Mohm					
4	10 Mohm					
5a	-0.2 ohm					
5b	-0.2 ohm					
5c	-0.2 ohm					
6	500 A					
7	1000 A					
8a	100 A					
8b	100 A					
8c	100 A					
9a	500 A					
9b	500 A					
9c	500 A					
10a	500 A					
10b	500 A					
10c	500 A					
11	100 A					
12	500 A					
13	500 A					
14	10 A					
15	500 A					
16	500 A					
17	5000 A					
18	5000 A					

Fault Finding

This section is intended as an aid to fault finding and should be used in conjunction with the relevant circuit diagrams at the back of this manual.

Warning: Recalibration and safety checks MUST be carried out after any repair.

Digital Display Problems

Symptom Suspect Area Check

Power on but no displayMains fuses Fault on XP power supply Main processor card not running Ribbon interface from digital p.c.b to display p.c.b. Check fuses Check DC outputs First check ribbon cable between Digital and display p.c.b.'s. If OK, see if any front panel switches have any effect. If not, processor probably not running Connections at J4 on digital p.c.b and on display p.c.b. Segment, strobe and energise LED signals (pulses) present on J4

POWER ON LED is illuminated, but nothing else Fault on XP power supply Main processor card not running Ribbon interface from digital p.c.b to display p.c.b. Check DC outputs First check ribbon cable between Digital and display p.c.b.'s. If OK, see if any front panel switches have any effect. If not, processor probably not running Connections at J4 on digital p.c.b and on display p.c.b. Segment, strobe and energise LED signals (pulses) present on J4

Chart Recorder Problems

Symptom Suspect Area Check

Recorder does not feed paper but speed display illuminates Cables Printer power supply Motor control Connections of interface cables Printhead voltage Motor strobe signals

Recorder feeds paper but does not print Printhead interface Printhead alignment Printhead pressure Data and strobe pulses Printhead fixing screws. If loose, printhead will misalign. Re-align using test trace; ensure screw are tight Loose fixing screws in spring mounting bars, broken spring

Misalignment of trace on chart paper Printhead lateral alignment Releasing the two M4 screws at rear of printhead mounting bracket allows movement laterally; re-tighten screws after adjustment

Ultrasound Problems

Symptom Suspect Area Check

Ultrasound does not function Transducer Other areas Replace transducer Audio select switch is selecting correct channel Wiring from main Digital p.c.b. to front connector, both co-axial for ultrasound and digital wires for mode detect Ultrasound transmit oscillator output from Digital p.c.b.

Ultrasound signals OK but no audio input signal gives a correlated output indication Loudspeaker connections Controls Check wires have not become detached from loudspeaker terminals Volume control set low Incorrect audio channel selection

Electrocardiograph (ECG) Problems

Symptom Suspect Circuit Check

ECG does not function ECG mode select not seen Leg plate connections ECG p.c.b assembly Links / leads / connections ECG electrode connections to leg plate missing Continuity of leg clip terminals to plug contacts Check overall functioning with ECG simulator. Connect ECG simulator to CARDIO input on monitor. Set output to 120 BPM. Check ECG rate is displayed, output from loudspeaker and also printed correctly Run printer and check that status line indicates that ECG is connected. If not, either links in ECG lead are missing or faulty, or connections between connector and main Digital p.c.b. faulty

Uterine Activity Problems

Symptom	Suspect Area	Check
UA pressure does not register on chart printout	UA mode select not seen	TOCO transducer Links/leads/connections
	Replace transducer	Run printer and check that status line indicates that UA is connected. If not, either links in UA lead are missing or faulty, or connections between connector and main Digital p.c.b. faulty

Recommended spares

Description	Drawing/Part Number
Cable Assembly (Ribbon, 60way)	M/4/0070
Cable Assembly (Ribbon, 60way)	M/4/0071
Capacitor 0.0047 F	B E001044
DEXDYNE 486 CPU PCB Assembly	0400 8108
Digital PCB	0400 8201
Display PCB	0400 8202
ECG PCB Assembly	0260 8203
EPROM SGST 27C200112F1	B E001055
External Mark Patient Switch	
Fan Motor Assembly	G/3/4046
Fuse T2A (Mains Input)	
Fuse (XP Power Supply Unit)	
Fused Appliance Filter Inlet (Schaffner)	B E000377
LCD Display Module	4420 6268
Lithium Battery	
Paper Sensor Assembly	M/3/0069
Speaker	6540 0077
Step Motor N 103 546 5540	B E001000
Thermal Printhead QP 128	B E001001
Timing Belt 71 MXL 0.080" Pitch	B M001002
Timing Belt 122 MXL 0.080" Pitch	B M001003
Transducer (21T Ultrasound)	M/1/0059
Transducer (21T Ultrasound)	0215 0003
Transducer (21T Uterine Activity)	M/1/0082
Transformer (Mains) 110/240 volt	
Transient Suppressor (SA 5.0A, RS 192654)	B E001047
Tubular Ferrite Sleeve Farnel 559532	B E001043

Note: Chart paper supplies may be obtained from Seward Ltd at the address stated on page 2 of this manual.

Parts lists

The following parts lists are included in this section:

Description	Assembly Number	Page
Carriage Assembly	M/1/0002	19
Electrical Assembly	M/1/0057	21
General Assembly	M/1/0002	22

Carriage Assembly Drawing Number M/1/0002

Description	Drawing/Part Number	M/1/0002 Item Number	Quantity
Base Plate	M/3/0013	9	1
Bush	7159 1010	20	6
Cam	M/3/0010	6	1
Cam Bush	M/4/0008	18	1
Crimp Terminal	5250 1000	44	4
Crimp Terminal Housing 10 way	5211 1010	43	1
Door	M/2/0004	1	1
Earth Lead Carriage to Door	M/4/0075	23	1
Earth Lead Carriage to Paper Tray	M/4/0076	24	1
Foot	M/3/0005	2	2
Hex Nut M4 SS	B H000568	38	2
Hex Skt Cap Hd M4X12LG Screw SS	B H000122	32	4
Hex Skt Cap Hd M3X10LG Screw SS	B H000214	33	8
Hex Skt Cap Hd M4X10LG Screw SS	B H000596	34	7
Hex Skt Set Screw M3X3LG SS	B H001008	36	4
Hex Skt Set Screw M3X5LG SS	B H001009	37	6
Hex Skt Set Screw M3X6LG SS	B H001006	39	10
Large Pulley	M/3/00019	15	1
Lever Assembly	M/3/0011	7	1
Lever Knob	M/4/0012	8	1
Motor Pulley	M/3/0017	1	12
Nylon Spacer 13RS016040	B H001010	42	1
Nylon Washer M5 X 1.0 THK	B H001004	30	4
Paper Sensor Assembly	M/3/0069	21	1
Paper Tray	M/3/0009	5	1
Peel Bar	M/4/0007	4	1
Pivot Bar	M/4/0032	19	1
Printer Head Lead	M/3/0041	22	1
Push Rivet 4 x 6.5 LG 072 5884	B H001005	31	2
Roller	M/2/0006	3	1
Roller Pulley	M/3/0018	14	1
Screw SLTD Csk Hd M3X6LG SS	B H000167	35	1
Side Plate	M/3/0015	11	2

Carriage Assembly M/1/0002 (cont)

Description	Drawing/Part Number	M/1/0002 Item Number	Quantity
Spring Clamp	M/3/0016	12	1
Step Motor N 103 546 5540	B E001000	26	1
Tension Pin 1.5X12LG SS	B H001007	40	1
Thermal Print Head QP128	B E001001	27	1
Timing Belt 71 MXL 0.080" Pitch	B M001002	28	1
Timing Belt 122 MXL 0.080" Pitch	B M001003	29	1
Top Plate	M/3/0013	10	1
Washer M3 SS	B H0001447	41	10

Electrical Assembly Drawing Number M/1/0057

Description	Drawing/Part Number	M/1/0057 Item Number	Quantity
Cable AssemblyDisplay PCB to J14	M/4/0067	7	1
Cable AssemblyLow Voltage Supply	M/3/0061	1	1
Cable AssemblyMains Supply	M/3/0072	11	1
Cable AssemblyUA/Transducer Socket to ECG Connector	M/4/0063	3	1
Cable AssemblyUA/Transducer Socket to J24	M/4/0064	4	1
Cable AssemblyUA/Transducer Socket to JM20/21	M/4/0065	5	2
Cable AssemblyUA/Transducer Socket to J23	M/4/0066	6	1
Cable AssemblyPrinter	M/3/0041	14	1
Cable AssemblyRibbon, 60-way	M/4/0070	9	1
Cable AssemblyRibbon, 20-way	M/4/0071	10	1
Capacitor0.0047 FFarnell 106767	B E001043	21	3
Fan Motor Assembly	G/3/4046	26	1
Fused Appliance Filter Inlet (Schaffner)	B E000377	45	1
Lead Speaker to J22	M/4/0062	2	1
Link JM10	M/4/0068	8	1
Nortronic Flexistrip, 14-way, 30mm LG	70400014	25	1
PCB Mounting HeaderFarnell 460620 60 way	B E001045	22	1
Transition Connector, 60-way, RS 1927726	B E001046	23	1
Transition Suppressor, SA 5.0A, RS 1927726	B E001047	24	1
Tubular Ferrite SleeveFarnell 559532	B E001043	20	2

General Assembly Drawing Number M/1/0002

Description	Drawing/Part Number	M/1/0002 Item Number	Quantity
Base	M/1/0058	10	1
Card Guides	76120100	26	2
Carriage Assembly	M/1/003	1	1
Chassis	M/2/0053	8	1
Chassis Socket, 12 way, Pink	56210212	57	1
Chassis Socket, 12-way, Yellow	56214012	58	1
Chassis Socket, 12-way, Blue	56216012	59	1
Connector Plate, 3-way	M/3/0060	11	1
Cover	M/1/0056	9	1
Crimp Terminal, M3 Eyelet	56700003	60	1
DEXDYNE 486 PCB	04008108	19	1
Digital PCB	04008201	18	1
Display PCB	04008202	22	1
Earth LeadPower Connector	M/4/0073	29	1
Earth LeadCarriage to Chassis	M/4/0074	30	1
Earth LeadCarriage to Paper Tray	M/4/0076	31	1
Earth LeadLid to Chassis	M/4/0078	32	1
Earth LeadRear Panel to Chassis	M/4/0079	33	1
Earth LeadFront Panel to Chassis	M/4/0080	34	1
Earth LeadFront Panel to Front Panel	M/4/0081	35	1
ECG PCB Assembly	02608203	20	1
Electrical Assembly	M/1/0057	15	1
EPROM, SGST 27C200112F1	B E001055	19A	1
Front Moulding	M/1/0045	2	1
Front Panel Overlay	M/2/0049	4	1
Front Panel OverlaySEWARD	M/3/0050	5	1
Heatsink Modification	M/4/0084	17	1
IC Label	M/4/0085	36	1
LCD Display Module	44206268	21	1
Mains Inlet Socket	69000002	24	1
Mains Switch	61110000	27	1
Nut, SS, M3 Hex	B H000145	53	1
Nut, SS, M4 Hex	B H000568	54	8
'O' Ring, 8.7 ID x 12 OD, BS611	B M001075	61	2
Pillar, Male/Female Hex, PSM: SPA 02 MS M316	B M001052	51	2
Power Supply, XP	67007902	23	1
Programmable IC Label	M/4/0083	16	5
Rear Moulding	M/1/0046	3	1
Rear Panel Overlay	M/2/0051	6	1
Rear Power Label	M/3/0052	7	1
Screw, M4x12, Pozi C'sk Head, SS	71531512	56	2
Screw, M3x8, Pozi Pan Head, SS	71511308	40	11
Screw, M4x10, Pozi Pan Head, SS	71511510	41	5
Screw, M4x16, Pozi Pan Head, SS	71511516	42	4

General Assembly Drawing Number M/1/0002 (cont)

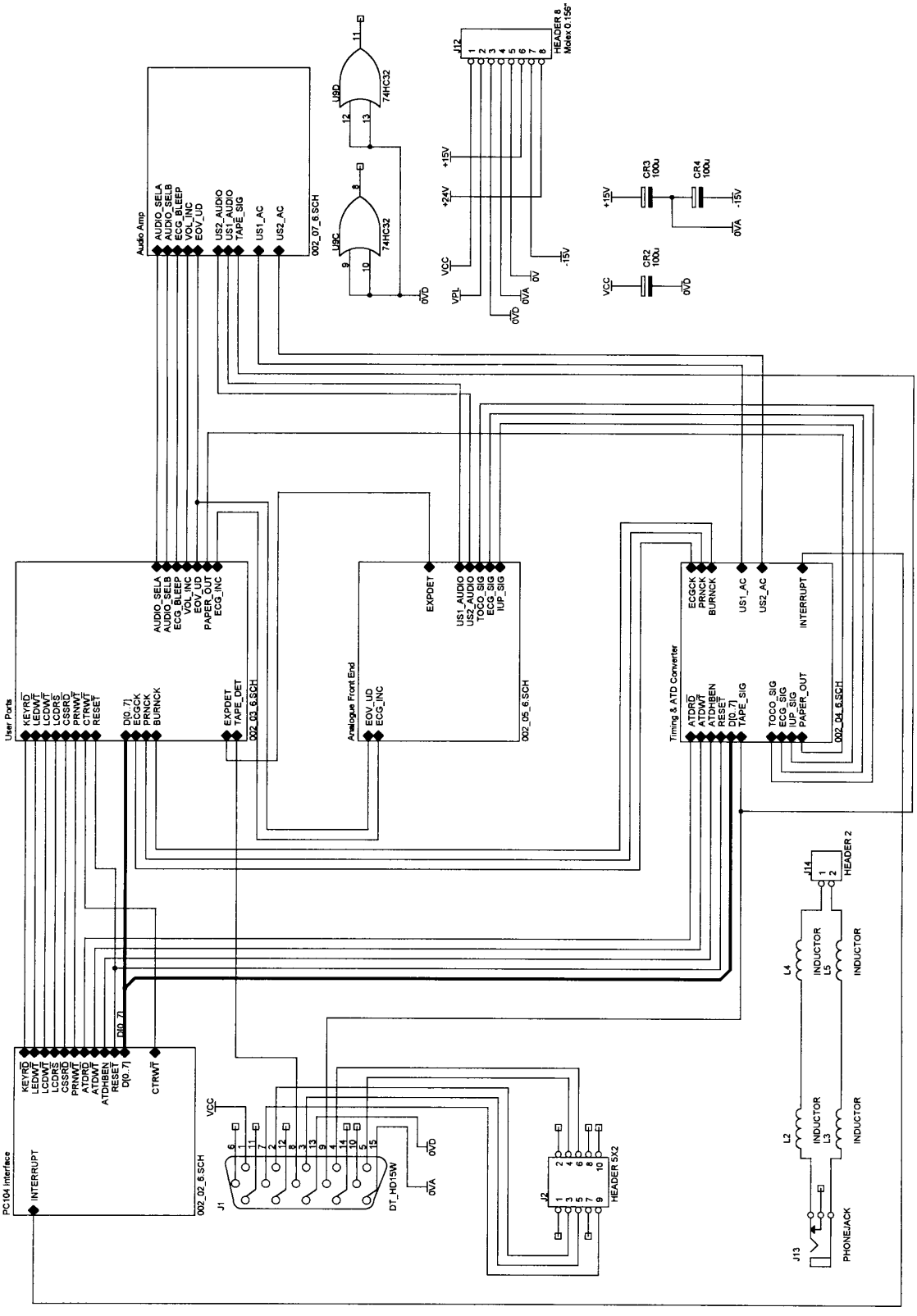
Description	**Drawing/Part Number**	**M/1/0002 Item Number**	**Quantity**
Screw, M3x6, Pozi Pan Head, SS	71511306	43	25
Screw, M3x12, Pozi Pan Head, SS	71511312	44	4
Screw, M4x12, Pozi Pan Head, SS	71511512	45	2
Screw, M2x6, Pozi Pan Head, SS	71511106	46	2
Spacer, M4	72450004	39	4
Spade Terminal Post	56400250	52	1
Speaker	65400077	25	1
Terminal Post, Spade	56400250	52	1
Tilting Feet	73000211	28	2
Transducer, 21T Ultrasound	M/1/0059	12	1
Transducer, 21T Ultrasound	02150003	14	1
Transducer, 21T Uterine Activity	M/1/0082	13	1
Washer, M3, Nylon	71596032	47	4
Washer, M3, SS	71261300	48	24
Washer, M4, SS	71261500	55	14
Washer, Shakeproof, M3, SS	71511300	50	9
Washer, Shakeproof, M4, SS	71571500	49	16

Service information

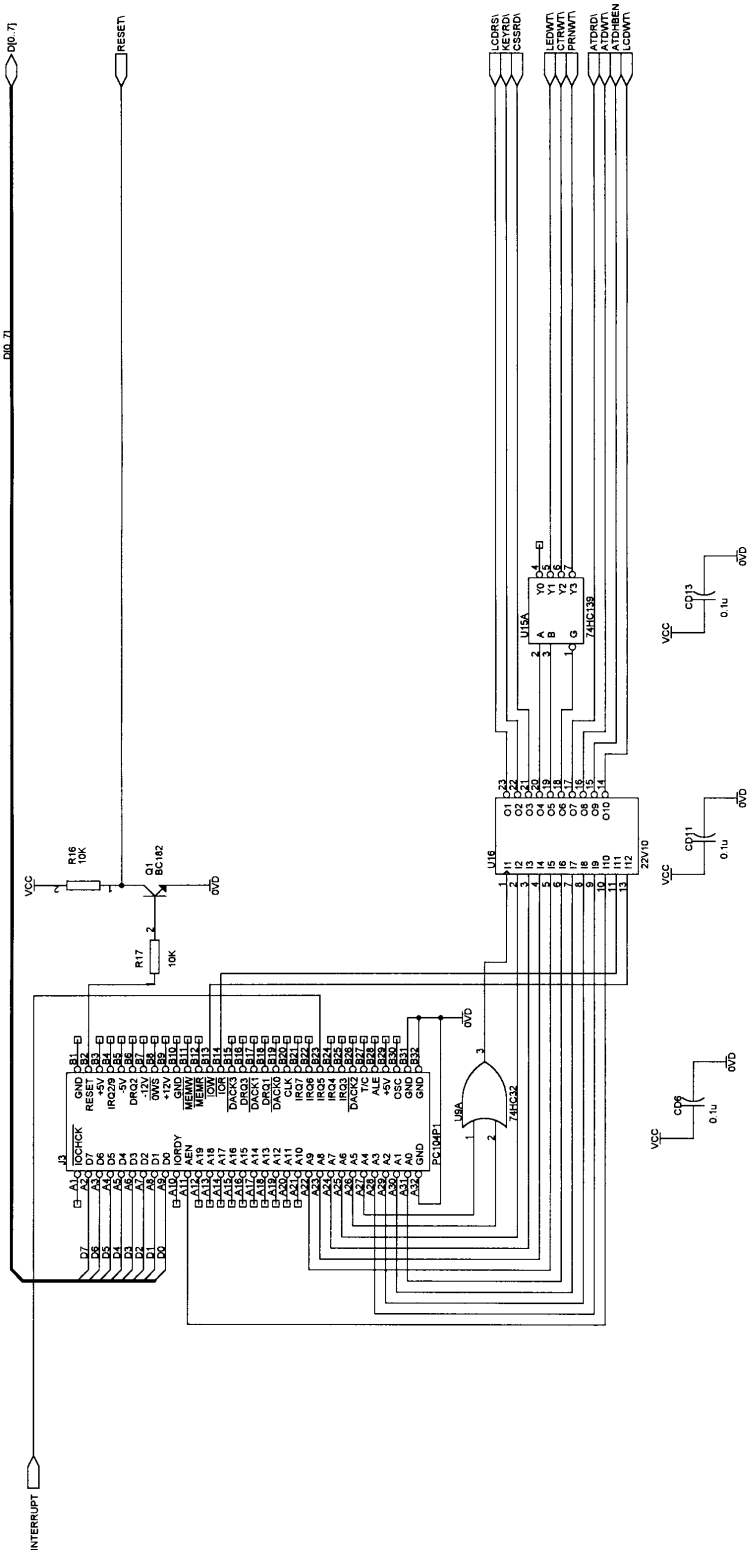
The form illustrated below is designed to record modification details or service information as it is released from the manufacturer.

ECN Ref N Details Effective Date

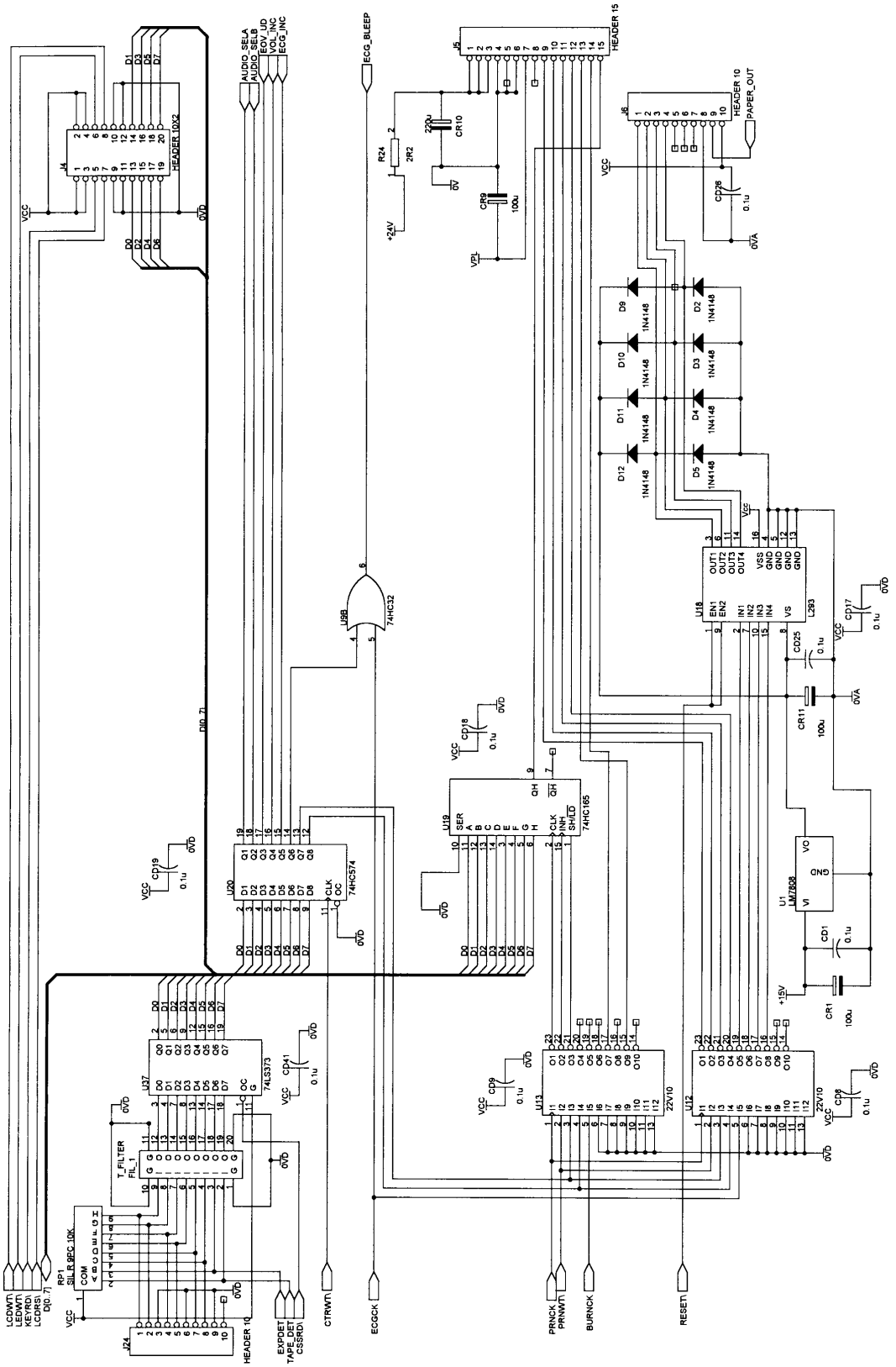
Drawing Number: 002 01 6 sheet 1 of 7



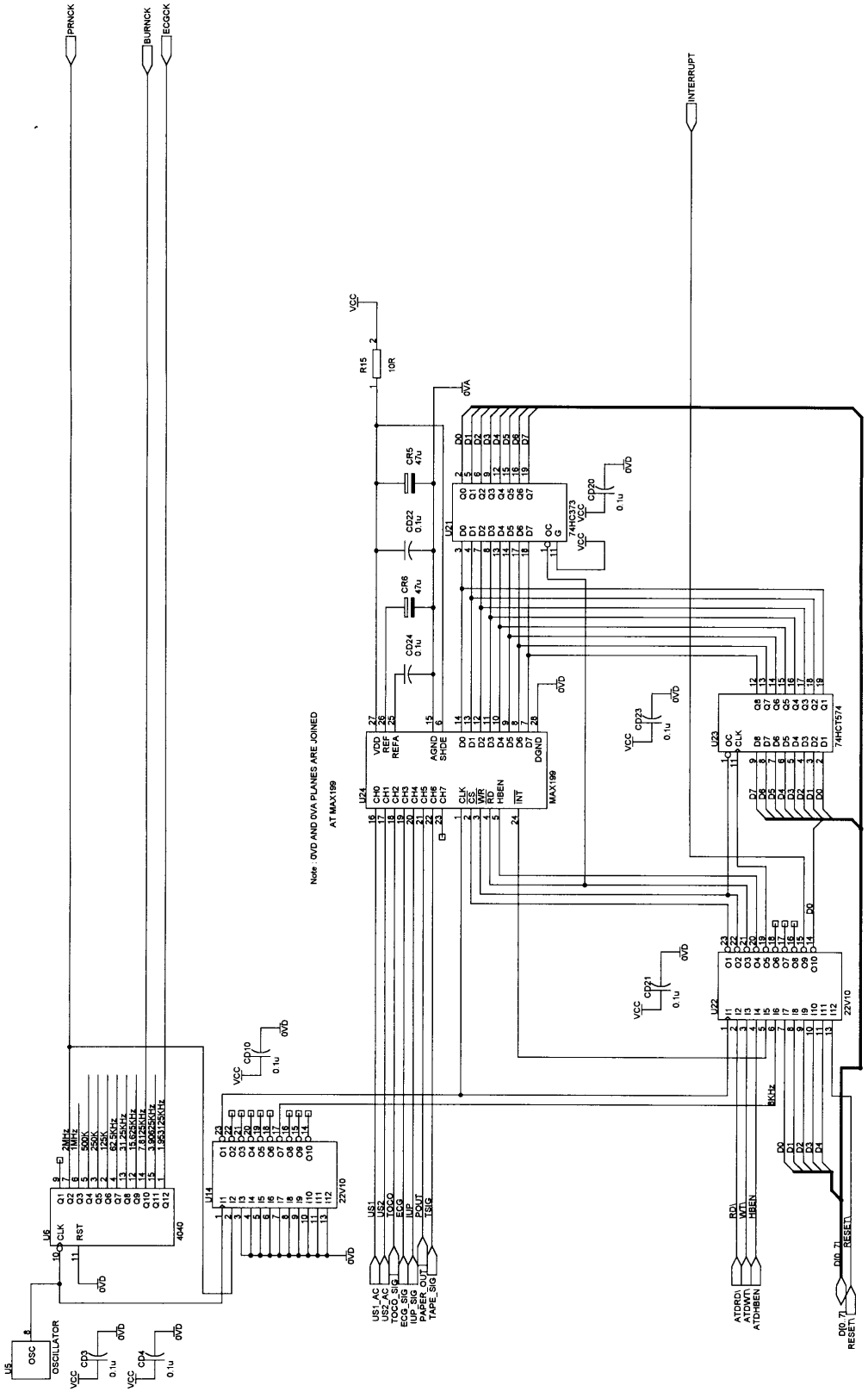
Drawing Number: 002 02 6 sheet 2 of 7



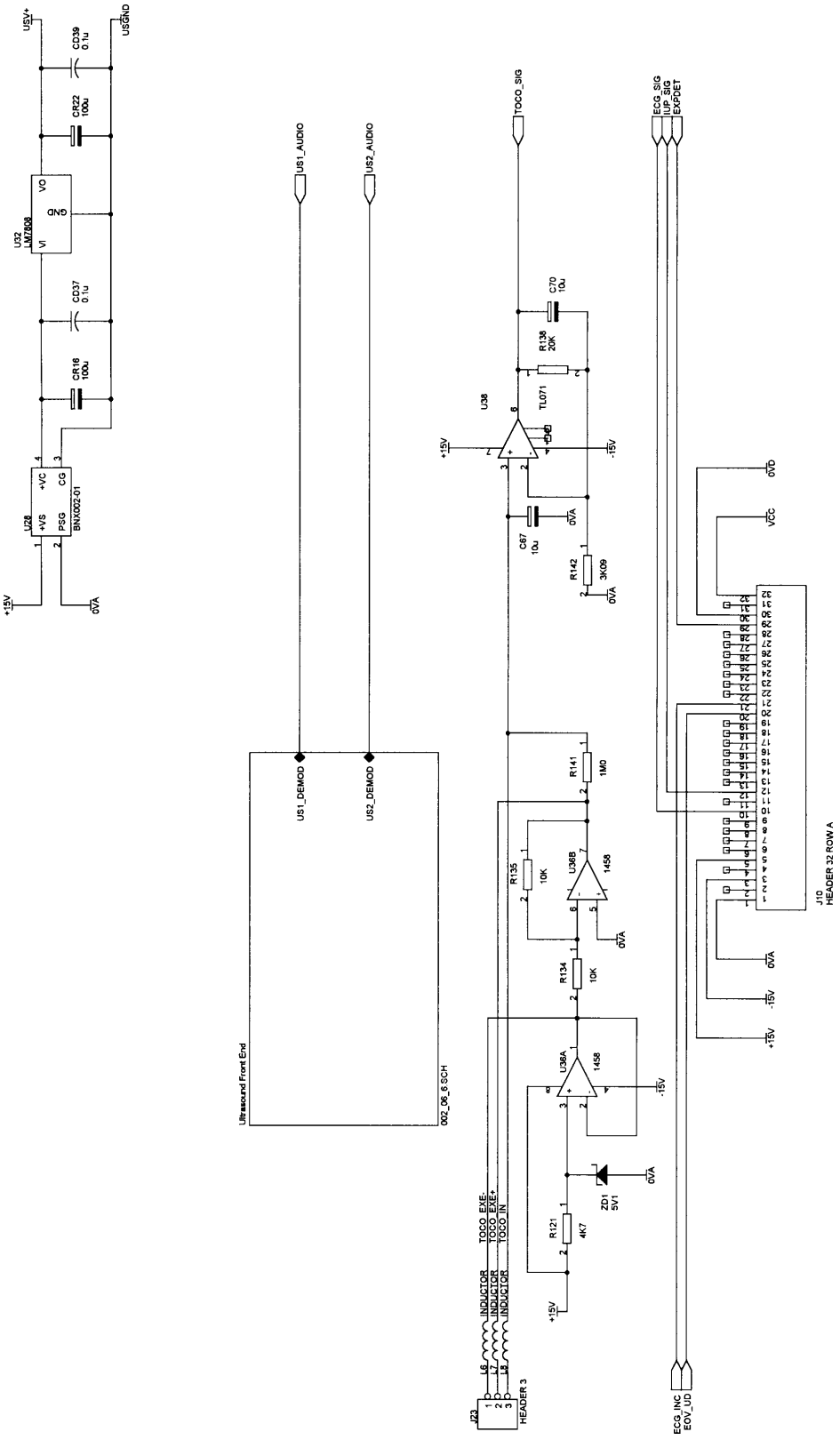
Drawing Number: 002 03 6 sheet 3 of 7



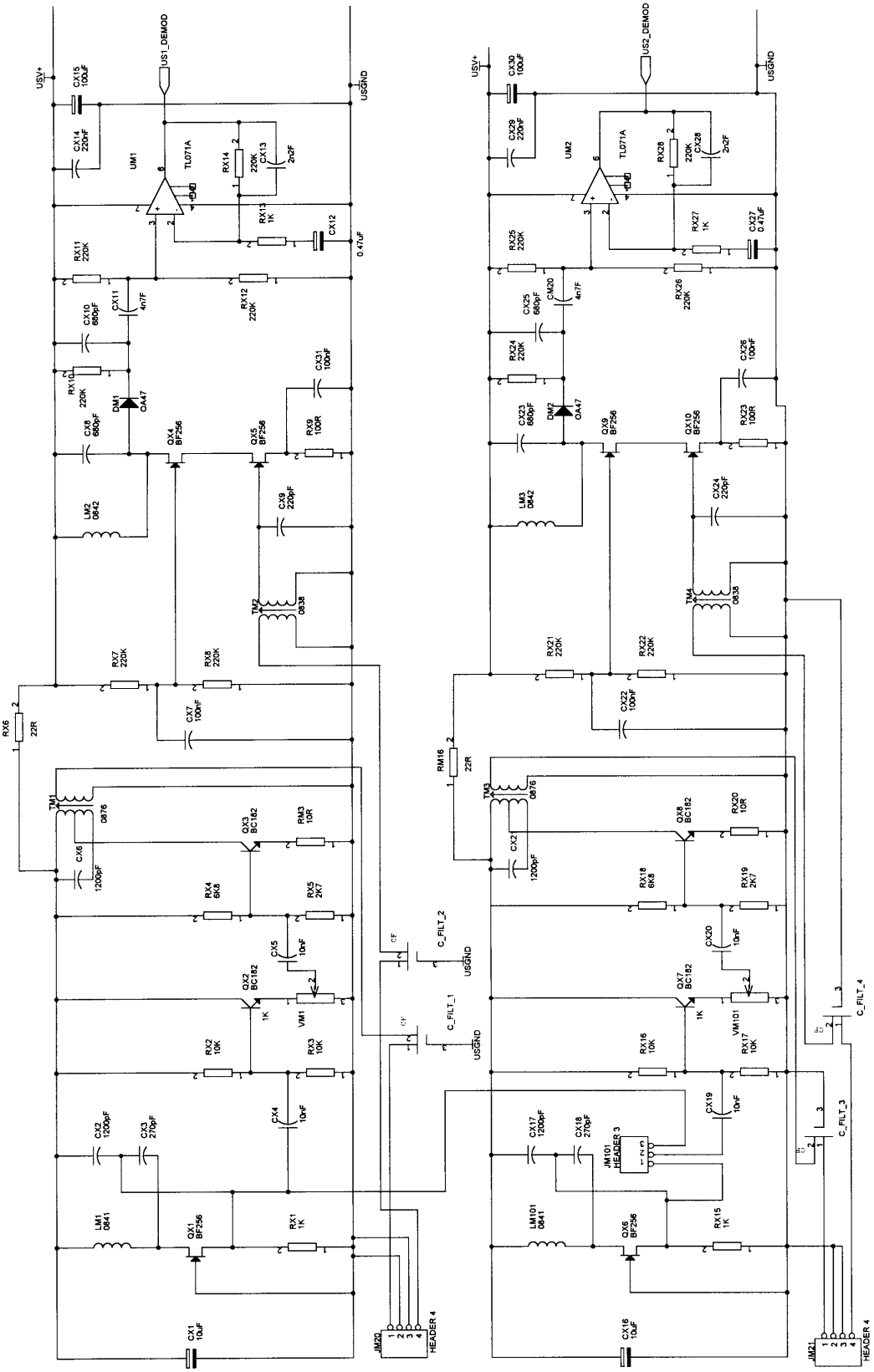
Drawing Number: 002 04 6 sheet 4 of 7



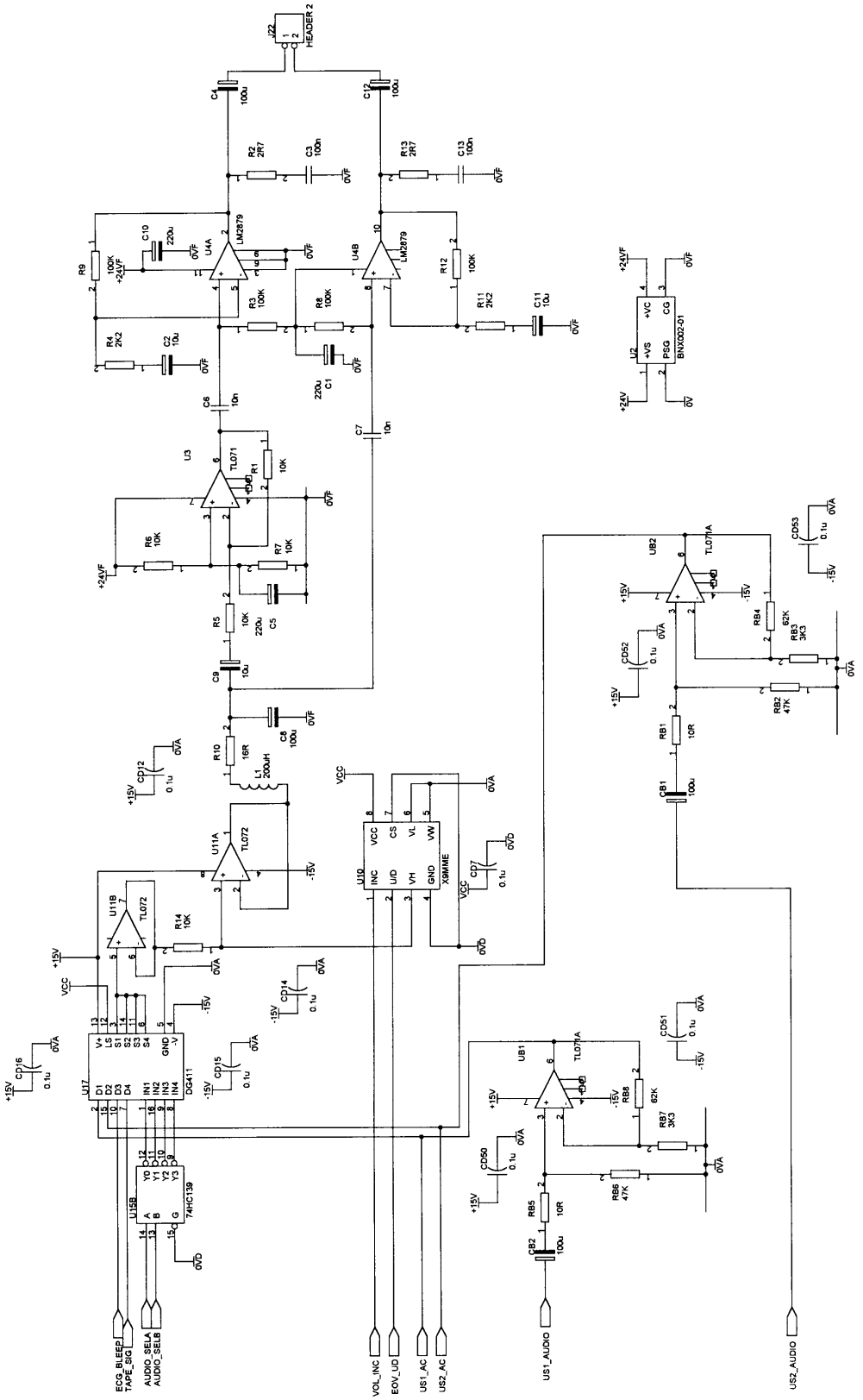
Drawing Number: 002 05 6 sheet 5 of 7



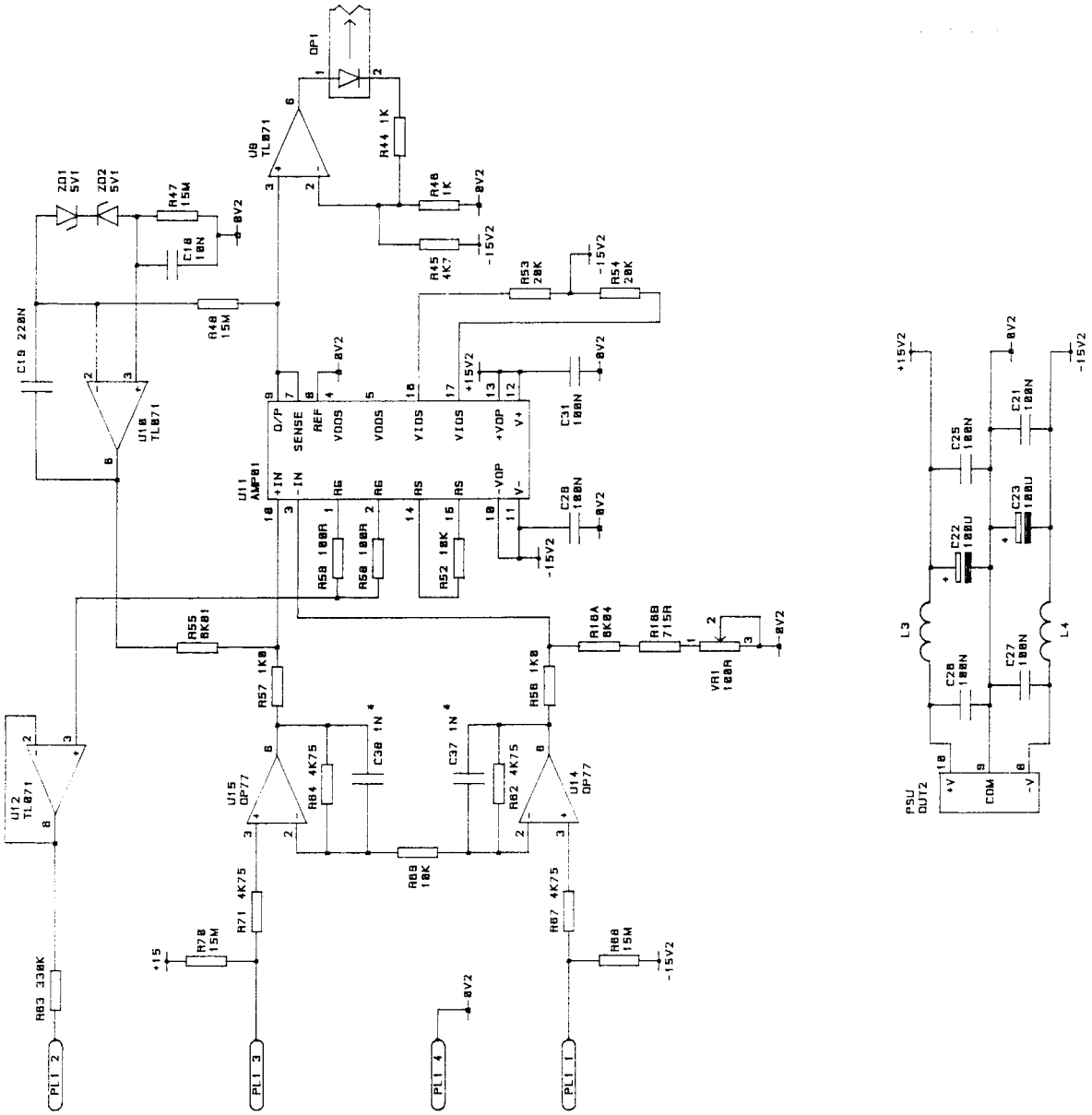
Drawing Number: 002 06 6 sheet 6 of 7



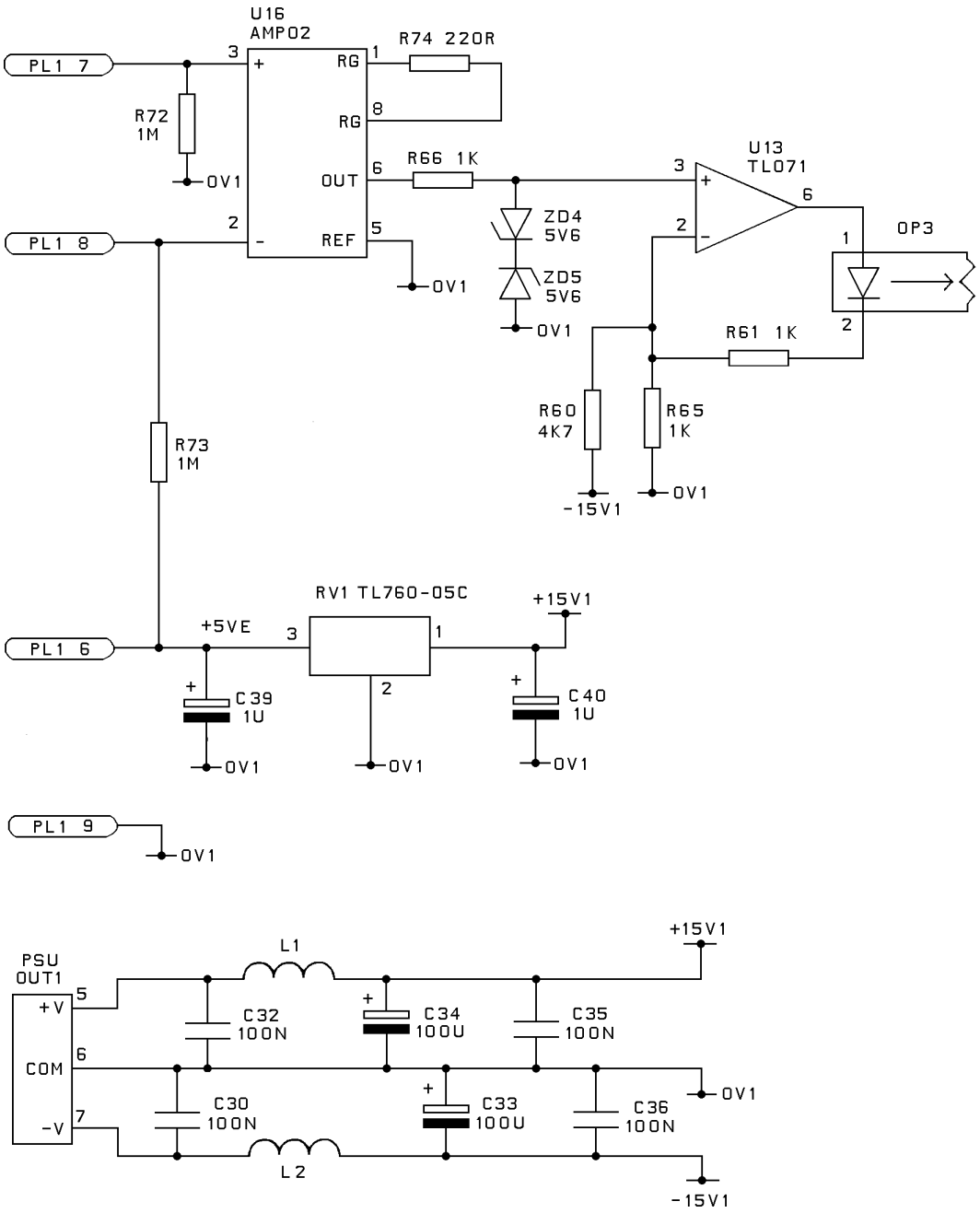
Drawing Number: 002 07 6 sheet 7 of 7



Drawing Number: 0260 8203 sheet 1 of 3



Drawing Number: 0260 8203 sheet 2 of 3



Drawing Number: 0260 8203 sheet 3 of 3